

BOOK 5

TREES AND FORESTS

Man has gone to the Moon but he does not know yet how to make a flame tree or a bird song. Let us keep our dear countries free from irreversible mistakes which would lead us in the future to long for these same birds and trees.

*Houphouet-Boigny
— President of the Ivory Coast*

TREES AND FORESTS

Look up for a moment, wherever you are, as you read this. Perhaps you are sitting at your desk in school or are stretched out on your bed at home. Take a quick glance around and make a list of all the things in sight that are connected with trees and forests. Some things are obviously made from the wood of trees — furniture, picture frames, pencils. Other things are not so obvious — what about the paper on which you are making this list? Or the turpentine that was used to thin the paint for the doors and windows? Perhaps there is a *mat* (chattai) on the floor or a *chik* on the window? It would

really take much more than a few moments to list all the things in your room that connect you to trees and forests.

What is a forest?

We all know what a tree is. But when people talk of forests they often mean quite different things. If you lived in the Himalayas, you would think of rhododendrons, deodars and cedars. If you lived in central India you would think of sal and mahua trees. If you lived in a village on the edge of the forest you would think of it as a place to go to collect fuelwood and dry leaves. But if you were an industrialist with a paper factory you would think of it as a source of raw material.



It is actually easier to say what a forest does, than what it is. It provides shelter and food for other plants, animals and people. It captures and stores an enormous amount of water, like an immense reservoir, and the water is released in springs and streams which flow down and are used by people who live far away from the forest.

Do you think a row of trees along a road or a railway line can be called a forest? What about a large clump of trees planted in the corner of a city park?

A row of trees, or even a group of them, does not by itself make a forest. For a forest is much more than a collection of trees. It is a complex ecological system, which includes plants and animals bound to one another and to the environment by a flow of energy and food. (See Unit 3).

The Earth has a great variety of ecosystems, such as tundra, grassland, desert and wetland, but the *forest ecosystem* is, perhaps, the most remarkable because of its great diversity and wide distribution.

Every forest creates a special environment, in which the trees play a leading role. They are the builders of the forest. During the course of evolution they have developed long-lived bodies, and occupy a large space both above and below the ground. So, they can use and store an immense amount of solar energy.

The peepal tree has a very long life. Not far from Delhi, in the temple town of Hardwar, there are some ancient peepals, which are believed to be older than the present town itself. They are believed to date back to about the 11th century.

A peepal tree which was taken from India to Sri Lanka in 288 B.C. is reported to be still alive. Records of its growth over the centuries have been carefully maintained. It must be around 2270 years old — and still flourishing.

The world's tallest trees are the giant Sequoias or redwoods of California, in the United States. They have reached heights of over 100 metres. The Sequoias belong to one of the few

surviving species of trees which used to exist even in pre-historic forests.

A mature forest ecosystem evolves over a long period of time, during which it goes through successive changes. From the roots of the trees under the ground to the top of the tree canopies high in the air, a forest is full of life. Different forms of life are adapted to different layers or zones of the forest.

Forests and people

Forests help to maintain the Earth's climate and water cycle, and they provide us with a variety of resources. Indeed, the link between forests and people goes even deeper, to the very structure and physiology of our bodies. Scientists tell us that the human body has many signs of its evolutionary ancestry from the forest-dwelling apes. Our limbs and the way we move, our digestive system and our senses, particularly sight, are believed to reveal our forest roots.

Through the ages, forests have provided people with food, fibre, building materials, fuel, fodder, medicines and a host of other resources. They were the source of agricultural tools and transport — the earliest boats, like the catamarans still in use in parts of India, ships and later railway sleepers. You can check with a school text book to find out all the innumerable things that human beings, today, derive from forests and trees.



The people who live within a forest or at its edge are the most closely linked with the forests. Many of them are tribals, like the Mundas, who are believed to be the earliest people who lived in India. Forest dwellers have evolved skills, a store of knowledge and a way of life in harmony with the forests around them. They recognise that the forest is a part of their heritage, a part of their religion and their economy. There are many songs that reflect the forest dweller's feeling of oneness with the forest. For example, in Garhwal the forest is called "mother's home" (miké).

Threats to the forest

In ancient times the only major threat to the forest was fire, which could occur naturally, or accidentally. Uncontrolled forest fires may have raged for days, devastating large tracts of forest.

Today, the causes of *deforestation* are much more varied and complex. And many of the problems can be traced back to the time when India was a colony of Britain. In the 19th century, the British divided India's forests into three categories. Some forests were *protected* to conserve the soil and the water sources. Other forests were *reserved* for industrial uses. The remaining forests, which were generally of much poorer quality were left for the people and were called *civil* or *community* forests. The rights that the villagers had previously enjoyed to collect fuel and fodder from the forests around their villages were severely curtailed, because these forests had been marked for industrial uses.

The reserved forests were supposed to be maintained on a scientific principle of *sustained yield*. According to this principle, only as many trees were supposed to be cut as could be regenerated. In practice, however, the profit motive outweighed the needs of both Nature and the local people. Especially during the two World Wars, immense quantities of timber from India were exported to Europe.

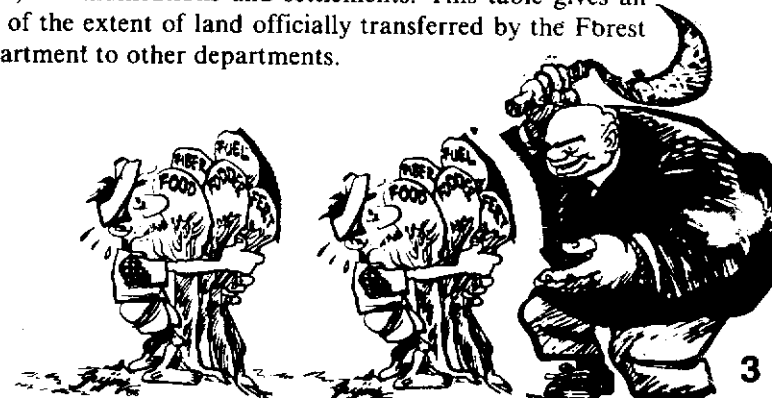
The result of these policies was that the people's traditional

links with the forest were broken, and the government took upon itself the role of protecting forests, which it interpreted as keeping people out of forests; and those who enjoyed the fruits of the forest lived far away, while those who lived nearest were deprived of its benefits. The consequences of this policy are the most serious threats to our forests.

Among the many causes of deforestation, today, the major cause is the desperate need for more agricultural land for poor people. Since British rule, forest-dwellers and other poor people, in times of hardship, have been forced to part with their small patches of land to traders and money-lenders. Unable to subsist on meagre wages as labourers, they have then had no alternative but to clear forest land for cultivation. In Maharashtra, Andhra Pradesh, Bihar and other states, such "encroachments" on forest land have led to bitter feuds between the authorities and poor people.

The big river valley projects are another major cause of deforestation. These multipurpose irrigation and power projects were launched with great enthusiasm soon after Independence. Jawaharlal Nehru called them the temples of modern India. But we did not know then that the price that would be extracted from the environment would be so high. (See Unit 10. on the Narmada).

Other causes of deforestation include mining and the establishment of industries and the clearing of forest land for roads, communications and settlements. This table gives an idea of the extent of land officially transferred by the Forest Department to other departments.



Forest area lost between 1951 and 1972

Purpose	Area (ha)
River valley projects	401,000
Agricultural purposes	2433,000
Roads and communications	55,000
Establishment of industries	125,000
Miscellaneous	388,000
Total area lost	3402,000

This list does not include lands under the Forest Department's control where the tree cover had been lost. In fact, we now know through satellite pictures that during the 1970s we were losing more than a million hectares of forest each year. Only 10 per cent of India's land area is now covered with *closed forests*, that is dense forests with tall trees.

Fuelwood collection by the poor is rarely the primary cause of large scale deforestation, but as forests are depleted or forest areas reduced due to other reasons, the pressure on the remaining forest trees increases. It is only when fuelwood becomes scarce, that poor people with no other alternatives may be forced to cut wood for burning, contributing to

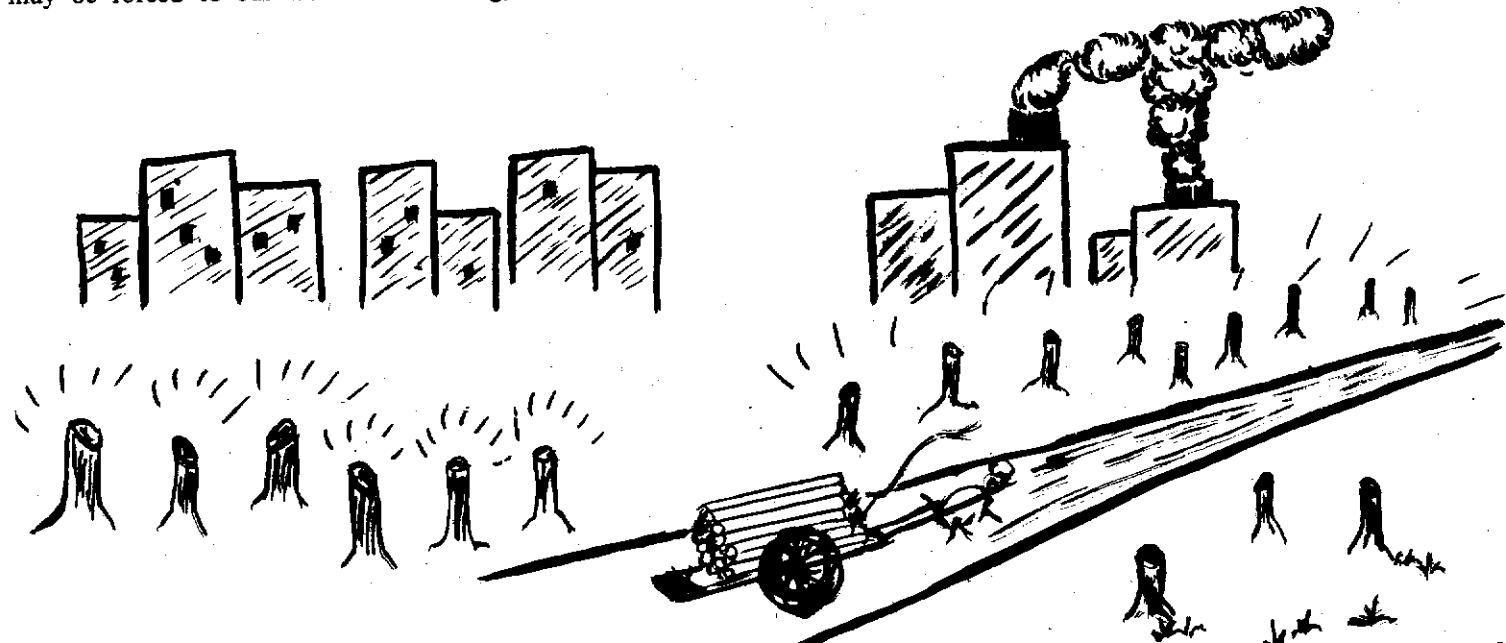
deforestation. (See Unit 8.).

Recently, the commercialisation of firewood — the cutting and selling of wood for urban consumers has become a significant factor in the pressure on forests. (See Unit 8).

The effects

Forests are a valuable resource. Their destruction affects the ecology of an area and the economy of the people. The major effects of deforestation are:

- ★ It deprives forest dwellers of their traditional habitat
- ★ It disrupts fresh water supplies
- ★ It may contribute to changing the local climate
- ★ It eliminates plants and animals that could provide us with future crops and medicines
- ★ It causes soil erosion, flooding and siltation of rivers and dams; this could lead to the irreversible loss of productive land
- ★ It reduces fuelwood supplies and building materials for people who may not have any other alternatives
- ★ It affects both large and small wood-based industries, and all those who are employed in these industries



Social forestry

There have been efforts both by government and by non-government agencies to protect our forests and improve the tree cover. Of all the afforestation (tree-planting) programmes, the most important is the Social Forestry Programme which was started in the 1970s.)

The social forestry programmes vary from state to state. They usually include strip plantations on road, rail and canal sides, village woodlots on both government and community land, the rehabilitation of degraded forests, and farm forestry on private land or land leased from government. Though the planting activity under the various components of social forestry has on the whole been quite impressive the programme has not achieved all objectives. This is because the subsidies have reached mainly the bigger and richer farmers; poor people have either not gained much, or have in fact suffered.

When there is a market for the wood, when the demand and the price is high, afforestation is an attractive proposition for big farmers. In Karnataka, farmers planted eucalyptus, under the social forestry programme, to sell at high prices to rayon and paper industries. Agricultural labourers suffered because the eucalyptus plantations replaced the traditional food crop of ragi (a kind of millet) and so there was less food available. Moreover, because eucalyptus requires less care, labourers lost their jobs.

Unlike the large social forestry programmes which have problems in reaching the most needy, new schemes have been developed to reach the poorest directly. In Rajasthan, villagers are being leased degraded forest land to plant trees. But the most successful programme has been in West Bengal, where government land was allocated to tribals and other landless poor, who had full rights to the use of the land and profits from it.

In Garhwal in Uttar Pradesh, the Dasholi Gram Swarajya Mandal, a non-government organisation, has organised

afforestation programmes in the villages to protect the sensitive catchment areas of the mountains, and to provide fuel and fodder to the people. (See Unit 5).

The Chipko leader Chandi Prashad Bhatt says, "Saving the forests is only the first step, saving ourselves is the goal."



If you cut one oak tree, plant at least three others.

— Chipko slogan

Activity

1

The Friend

There was a time when it stood there,
Tall, confident, green and always so dear;
I had my troubles and my pains,
But everytime I went to it — it wasn't in vain.

It made me smile, it was my friend;
A silent quiet friend, a friend so true,
A friend who understood, a friend who knew.

Yet one day it was there,
And the next it wasn't;
Thanks to some whims and a few fancies,
A crazy want of space and stony hearts.

I can feel the pain it went through,
I'm sorry I could never give it its due;
It hurts to know how lowly we are,
To know that we hurt and we scar,

The truth is often bitter,
And so was this;
The knowledge that it was no more,
This realisation ever so often comes to the fore,
The environment is changing, the open skies,
Have become clouded with smoke;
The grounds are slowly changing,
Their freshness and beauty being replaced by
wrinkles and scars.
The flying birds, swinging leaves,
Are all becoming rare to see;
The empty spaces are now a sight to behold,
For, all around us we see barren lands and rising poles.
It is all changing, changing for the worst,
The place where my friend stood is empty and dirty
now;

But the place it held in this heart of mine,
Will be its forever, for all times to come.

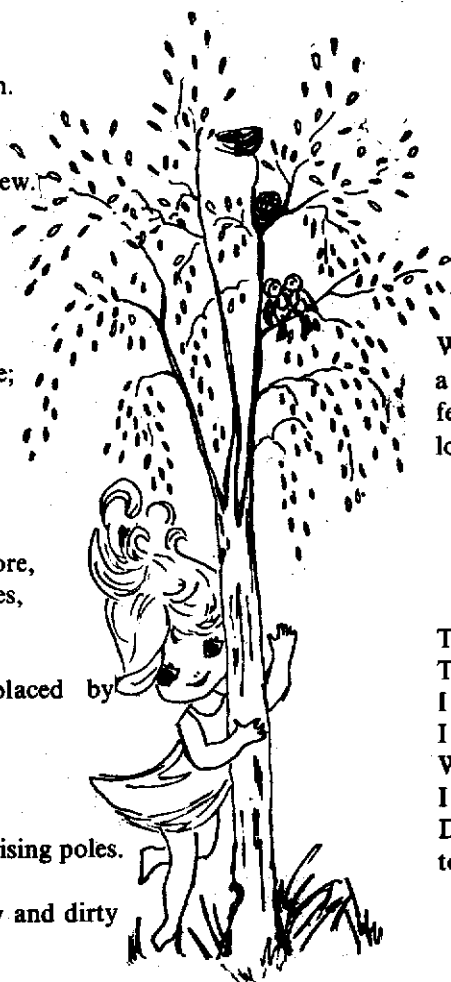
Shalini Ahluwalia
(Class XII)
Convent of Jesus & Mary

People who care about trees call themselves friends of trees. But in this poem the girl calls the tree her friend. Do you think trees need people, or do people need trees?

Write a poem about a tree, or trees. Think of a different ways in which to express your feelings. For instance, here is a short poem that looks at the cutting of trees in a humorous way.

They chop down 100ft. trees
To make chairs
I bought one
I am six-foot one inch
When I sit on the chair
I am four foot two
Did they really chop down a 100ft. tree
to make me look shorter?

— Spike Milligan



Activity

2

Make a Leaf Print

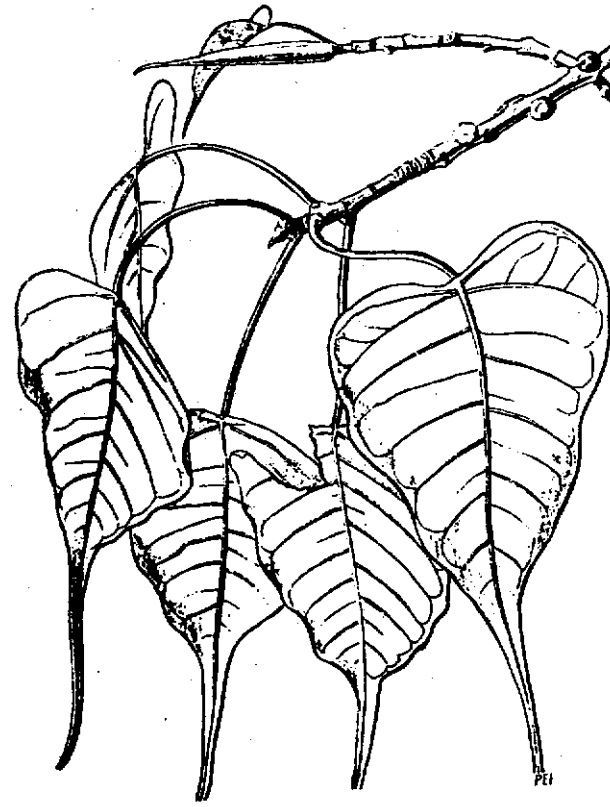
In some ways peepal trees are great show-offs. Even when there is no breeze, their beautiful leaves spin like tops, determined to attract your attention and invite you into their shade. And not only do they send down currents of cool air, but their long slender tips are also constantly striking together to make a sound like the pattering of raindrops.....

No other tree has a leaf which tapers to such a perfect point as the peepal. When it rains, you can see the water drip from the points. Water runs off more easily from a point than from a blunt end, and the sooner a leaf dries the better it is for the tree.

— Ruskin Bond.

Making leaf prints on paper is a bit messy but lots of fun. Here's how to do this:

1. You need a dry leaf with clear veins like the peepal leaf. You can press a green leaf within the folds of a newspaper or a notebook, and leave it under a weight for a few days until it dries.
2. Using very little water, brush some brightly-coloured poster paint on the entire leaf surface. Wait for a few seconds — as the paint dries out it will leave some of the surface bare.
3. With the painted side down, press the leaf gently on a sheet of paper. Smooth the leaf down, taking care to press the entire edge.
4. Gently pull the leaf off. There you have a leaf print. It takes three or four trials to get the right quantity of paint for a clear print.



Activity

3

Watch that tree!

When you look at a tree, what do you notice? Its flowers and leaves, its cool shade? A tree is a complex living being, and tree-watching, like bird-watching, can be great fun and very educative. Listed here are some of the simpler aspects of a tree that you could observe. You can do this individually, or in groups, and over a period of time, noting seasonal changes. Start with the trees in your own school compound or locality. In a file, notebook or diary, record the date and place of observation and, of course, the name of the tree if you have already identified it. Try to draw the outline shape and various parts of the tree — you don't need to be a great artist for this.

Remember, don't break off leaves and branches unnecessarily, and don't engrave your name on the bark!

Observe:

1. The height of the tree. (You can compare it to a nearby building. Each storey, in a multistorey building of city flats is

roughly about 3 metres high).

2. The shape of the canopy or crown (that is the top of the tree above the main trunk).

3. The nature of the bark (whether it is smooth or rough).

4. The shape, smell, texture and arrangement of the leaves.

5. The size, colour, structure of the flowers, cones, seed-pods or fruits.

6. The time (morning, evening, night) of flowering and the season of flowering, formation of seeds, maturing of fruit, leaf-fall if any.

7. The other living beings on or under the tree — bird's nests, spiders' webs, ant hills etc. (Read Unit 3; The Tree Plays Host).

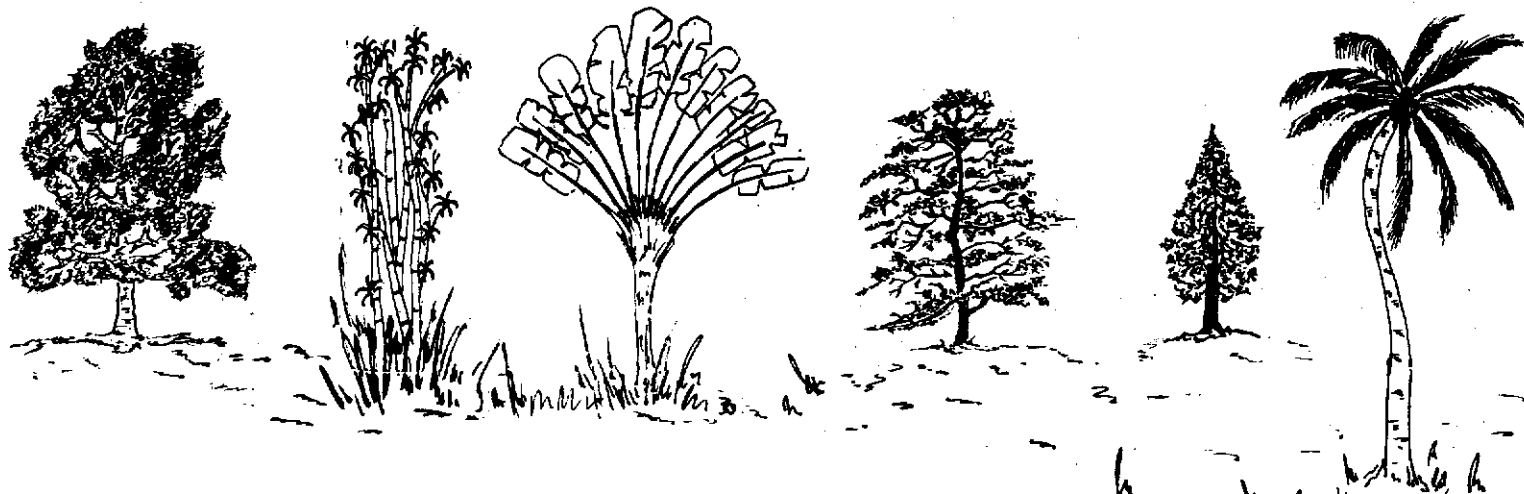
If you have not already identified the tree, you can try to do so with the help of books such as:

Common Trees by D.H. Santapau (National Book Trust)

The World of Trees by Ruskin Bond (National Book Trust)

Our Trees Neighbours by (NCERT Publications)

Then find out if any parts of the tree are used locally.



Activity

4

Plant a Sapling

The children of the Sadhana Primary School in Kaira District, Gujarat, had never seen an aircraft. They knew very little about Mahatma Gandhi though his Sabarmati Ashram was less than 100 kilometres away. One day the headmaster decided to take his students out on an excursion to Sabarmati. At Ahmedabad he took them to the airport, the zoo and other places of interest. Such a trip had never been possible before because the children were poor.

How did the headmaster manage this exciting trip? The school raised money by planting and looking after a small nursery of eucalyptus, gulmohur, tamarind and other trees for the Forest Department. Under this scheme they got polythene bags, seeds and seedlings to start their own nurseries. The Forest Department then bought back the saplings when they were about a metre high, or as tall as a child. Sadhana Primary School was able to earn Rs. 1500 that year by raising 10,000 saplings. The children used the money for their excursion to Sabarmati. What is more, they started a book bank for the poorest children of their school.

— Tara Ali Baig

(From *A Tree for Every Child*, SOS villages, New Delhi)

Saplings can be bought from tree nurseries. Many government departments and agencies, and civic bodies distribute saplings free to institutions such as schools.

Some trees, such as the champak, can be grown from a cutting — a neatly severed small branch. Be sure not to cut it when

the tree is in flower. And choose a favourable season. In many parts of India, the tree-planting festival, Vanamahotsav, is held in July, or whenever the rains come.

1. Dig a pit between half a metre and one meter deep, and as wide.
2. Put a little manure at the bottom. Sift the soil, clearing it of stones and pebbles. Mix an equal quantity of soil and manure.
3. Remove the sapling from its polythene bag, or make a large tear in the bottom of the bag. Place the sapling upright in the pit and cover the roots with the soil-manure mixture. Pat in down firmly.
4. Water the sapling; you may have to add some more soil as it settles down.
5. Water the soil regularly, so that the soil does not dry out.
6. And protect it from grazing animals.



Activity

From Field and Forest

You know that trees serve many different purposes. When we plant trees, we must know whether the climate & soil will suit the species we have chosen, and also whether it will be good for our needs. Here is a quiz about common Indian fuelwood species — all of them have other uses and are ecologically available for regenerating wastelands.

1. How many of these trees do you think you would be able to recognise?
2. Match these trees to the illustrations. Then try and find out how many of these trees grow in your town.

1. Babul/Prickly acacia

2. Neem

3. Lal Kachnar/Camel's foot tree/Bauhinia

4. Jangli jhau/Casuarina

5. Amla/Indian gooseberry

6. Imli/Tamarind

7. Bhan/Indian poplar

8. Jamun/Java plum

9. Ber/Indian jujube

10. Mahua/Indian butter tree

A



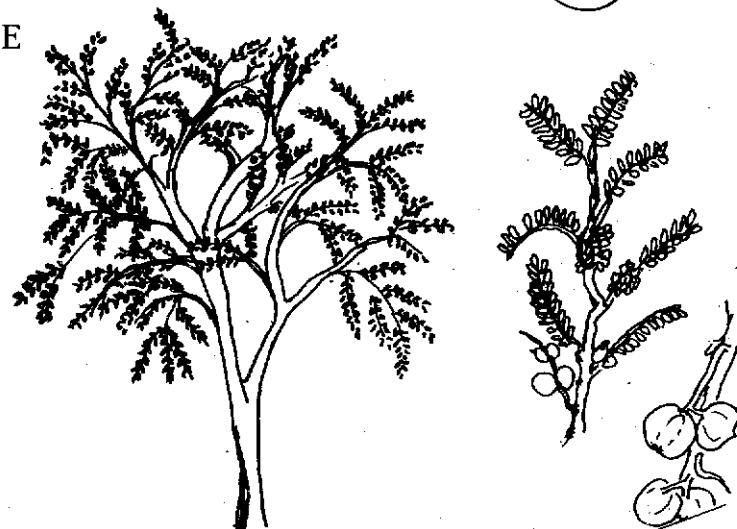
B



C



E



D



F



G



H



I



J



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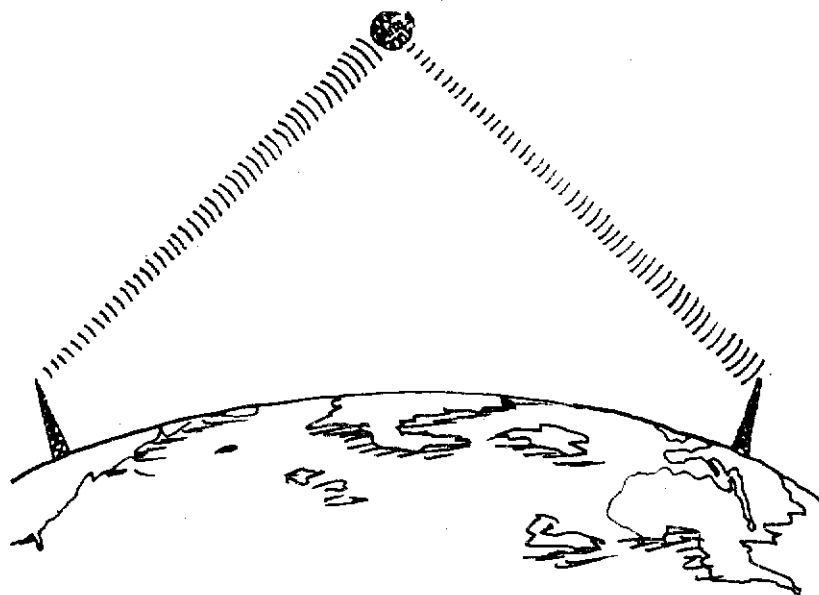
Key	Species	Common/local name	Ecological use	Other uses (excluding firewood)	Occurrence
A	1. <i>Acacia nilotica</i>	Prickly acacia/ babul	nitrogen-fixing/ for dry and arid areas	fodder/small timber	Drier regions of North Central and South India
B	2. <i>Azadirachta indica</i>	Neem	wind-breaker/for arid and nutrient deficient soil	organic fertiliser/ medicine	Throughout India
C	3. <i>Bauhinia purpurea</i>	Camel's foot tree/ lal kachnar	nitrogen-fixing	fodder/food/small timber	Western Himalayas, North India, Assam, Khasi hills, Western peninsula
D	4. <i>Casuarina equisetifolia</i>	Jangli jhau	nitrogen-fixing/ windbreaker/ for water logged soil/for saline-sandy coasts.	small timber	Tropical India
E	5. <i>Emblica officinalis</i>	Indian gooseberry/ amla —		fodder/food/medicine	Throughout India
F	6. <i>Madhuca longifolia</i>	Indian butter tree/mahua	thrives on all types of soils	fodder in lean times/food/ medicine/pulp	Uttar Pradesh, Bihar, Andhra Pradesh, Karnataka, Bengal and Maharashtra
G	7. <i>Populus euphratica</i>	Indian poplar/bhan	for cold desert, rocky and hill soil/can tolerate brief flooding and salinity	timber	North-west Himalayas and river banks on Punjab plains
H	8. <i>Syzygium cumini</i>	Java plum/jamun	for clay and water-logged soil/along stream banks	fodder in lean times/ small timber/food	Throughout India
I	9. <i>Tamarindus indica</i>	Tamarind/imli	shelter belts to prevent erosion/for degraded land in dry areas	fodder/small timber/ food/medicine	Throughout plains and Sub-Himalayan tract
J	10. <i>Zizyphus mauritiana</i>	Indian jujube/ber	drought and frosthady/ withstands severe heat	fodder/small timber/food/ medicine/leaves used to feed tassar silkworm	Punjab, Uttar Pradesh, Bihar and Rajasthan

Activity

View from a Satellite

Satellite mapping is by far the quickest method of estimating the extent of forest areas. This method cannot cover areas which happen to be under snow, cloud or fog, and there are also some problems with interpreting the satellite pictures. The table shows the state-wise forest areas according to the satellite pictures, and the extent of the area under the Forest Department's control.

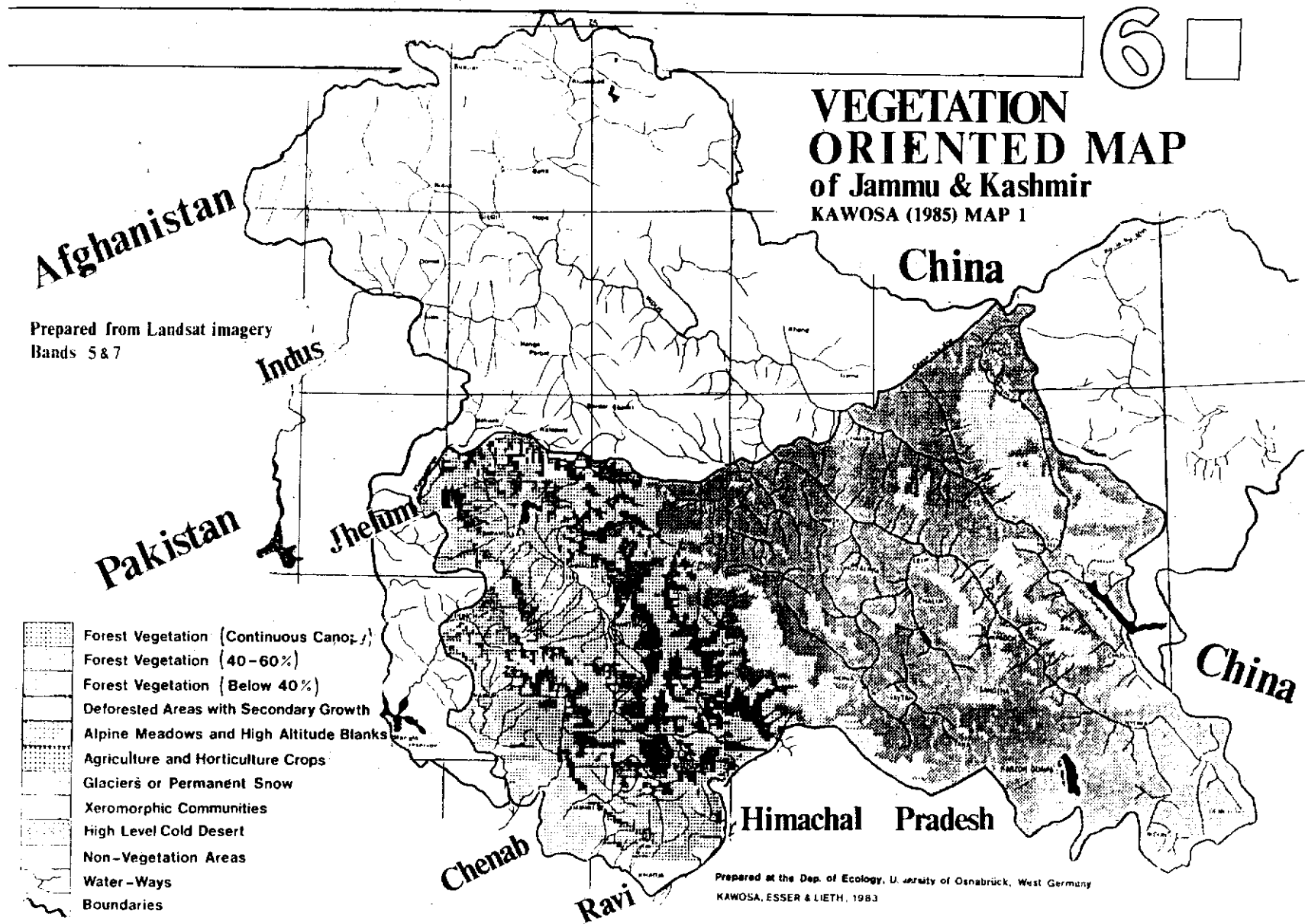
Make graphs to show: i) The State-wise reduction of forest area, by satellite data (columns a and b)
ii) The discrepancy between the satellite data and the area under the Forest Department's control.



State-wise forest areas by satellite data

State/Union Territory	Forest area by satellite data		Area controlled by forest department
	1972-1975	1980-82	1980
Andhra Pradesh	4.90	4.04	6.41
Assam	2.11	1.98	3.07
Bihar	2.27	2.01	2.92
Gujarat	0.95	0.51	1.95
Haryana	0.08	0.04	0.16
Himachal Pradesh	1.51	0.91	2.21
Jammu and Kashmir	2.23	1.44	2.19
Karnataka	2.95	2.57	3.79
Kerala	0.86	0.74	1.11
Madhya Pradesh	10.86	9.02	15.39
Maharashtra	4.07	3.04	6.41
Manipur	1.51	1.38	1.52
Meghalaya	1.44	1.25	0.86
Nagaland	0.82	0.81	0.29
Orissa	4.84	3.94	6.77
Punjab	0.11	0.05	0.24
Rajasthan	1.13	0.60	3.49
Sikkim	0.18	0.29	0.26
Tamil Nadu	1.67	1.32	2.18
Tripura	0.63	0.51	0.59
Uttar Pradesh	2.59	2.10	5.14
West Bengal	0.83	0.65	1.18
Andaman and Nicobar Islands	0.33	0.64	0.71
Arunachal Pradesh	5.14	5.21	5.15
Dadra and Nagar Haveli	0.02	0.01	0.02
Goa, Daman and Diu	0.12	0.11	0.11
Mizoram	1.39	1.20	0.71

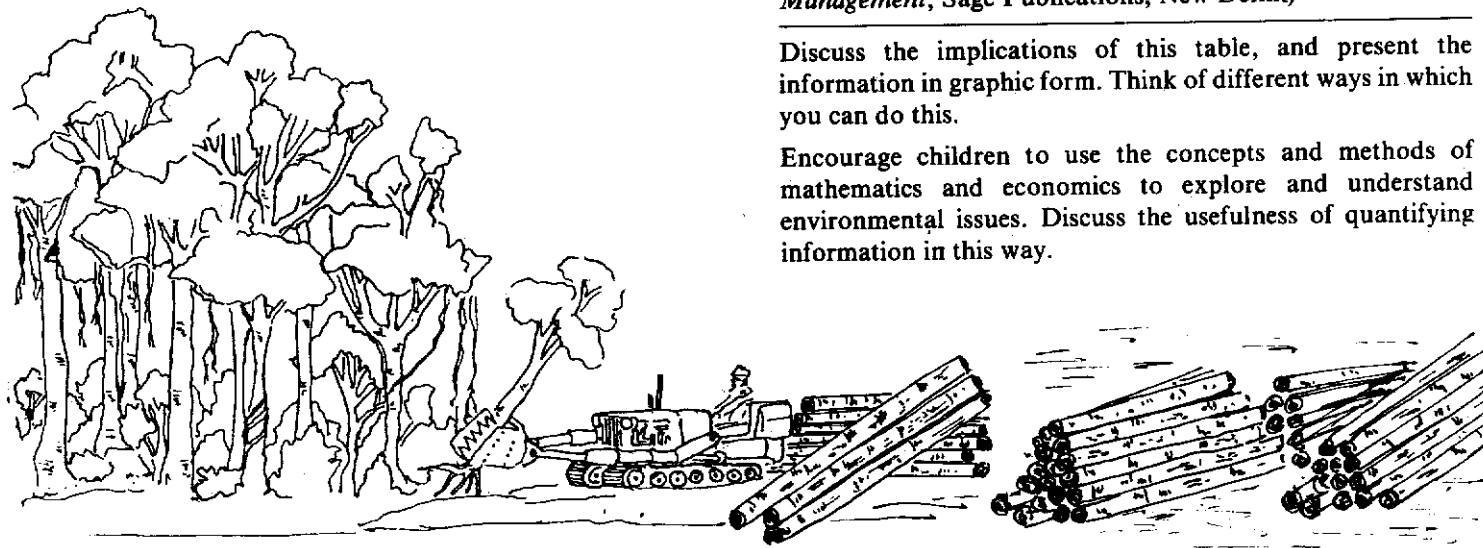
Source:- National Remote Sensing Agency



Activity

Income from the Forest

We know that forests contribute significantly to the local economy of the villages nearby. But very few economists have tried to work out a money-value for the villagers' dependence on the forests. A survey of four villages in Karnataka found that the major beneficiaries of the forest, among the villagers themselves, were the richer villagers, who cornered most of the fuelwood, grass and grazing areas available. But though the richest two classes gained the most in absolute terms, the poor peasants derived the largest share of their total income from forest use as a matter of survival. But for the local rich it is a matter of making profits.



Imputed income from forest

Class	Rs. per household	As % of total income
Biggest landlords	11,906	13.7
Rich farmers	6,537	17.2
Middle level peasants	3,799	18.1
Poor peasants	2,853	24.3
Agricultural labour	1,058	11.9
Service class	956	9.8
All	4,163	15.5

(Statistics from: M.V. Nadkarni with Syed Ajmal Pasha and L.S. Prabhakar, *The Political Economy of Forest Use and Management*, Sage Publications, New Delhi.)

Discuss the implications of this table, and present the information in graphic form. Think of different ways in which you can do this.

Encourage children to use the concepts and methods of mathematics and economics to explore and understand environmental issues. Discuss the usefulness of quantifying information in this way.

Activity



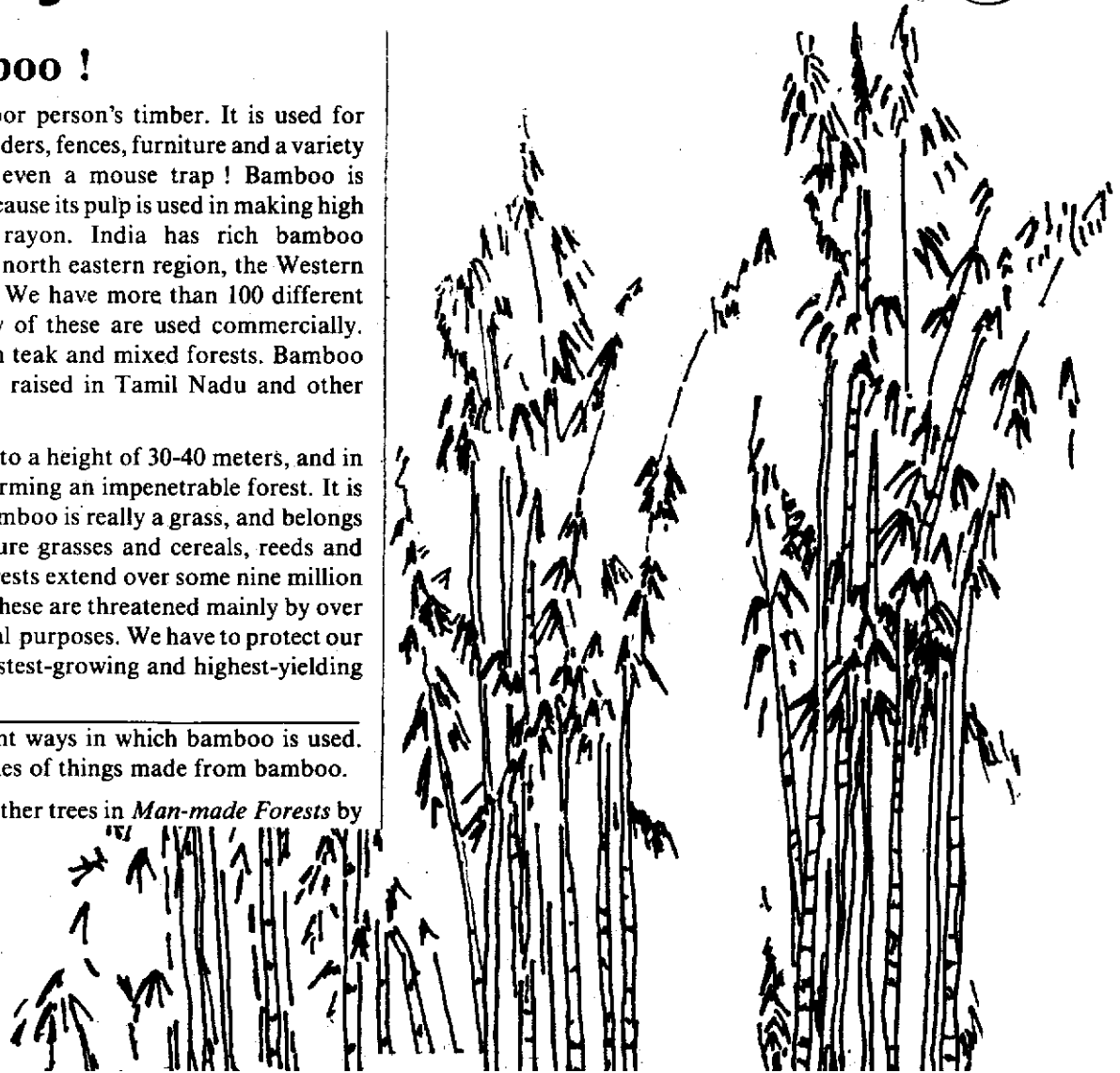
House of Bamboo !

In Asia, bamboo is the poor person's timber. It is used for building houses, making ladders, fences, furniture and a variety of household items. Yes, even a mouse trap ! Bamboo is commercially important because its pulp is used in making high quality paper, and also rayon. India has rich bamboo resources, especially in the north eastern region, the Western Ghats and the Andamans. We have more than 100 different species, though only a few of these are used commercially. Bamboos grow naturally in teak and mixed forests. Bamboo plantations have also been raised in Tamil Nadu and other states.

The bamboo grows swiftly to a height of 30-40 meters, and in large clumps, sometimes forming an impenetrable forest. It is strange to think that the bamboo is really a grass, and belongs to the same family as pasture grasses and cereals, reeds and sugarcane. Our bamboo forests extend over some nine million hectares in all. But, today, these are threatened mainly by over exploitation for commercial purposes. We have to protect our bamboos, which are our fastest-growing and highest-yielding renewable natural resource.

Think about all the different ways in which bamboo is used. Make a collection of sketches of things made from bamboo.

Read about bamboos and other trees in *Man-made Forests* by S. Kondas (N.C.E.R.T.)



Activity

The Famous Five

There are many different kinds (or types) of forests in India. This map shows the extent of the five main types in a simplified way. Put under each other 1. Himalayan mixed 2. Tropical evergreen 3. Tropical moist deciduous 4. Tropical dry deciduous 5. Tropical thorn.

Broadly, the type of forest depends on the climate — mainly rainfall and temperature. But forests vary locally depending on the topography of the land, the soil conditions, and water distribution.

Identify the broad type of forest in your area. Do a group project on this type of forest. Find out about a) the climate, b) the distinguishing characteristics of the forest type c) the lives of the people living in or near the forest.

Rainfall — note the range of seasonal variation

Temperature — note the range of seasonal variation

Type of tree — Deciduous/ Evergreen, dominant trees.

Density of growth — Closed (dense and tall trees), Open (less dense woodland)/ Savanna (open woodland with grass)

Distribution of water — Rain/ Swamp/ Floodplain/ Mangrove

Altitude — Terai/ Mountain/ Plain

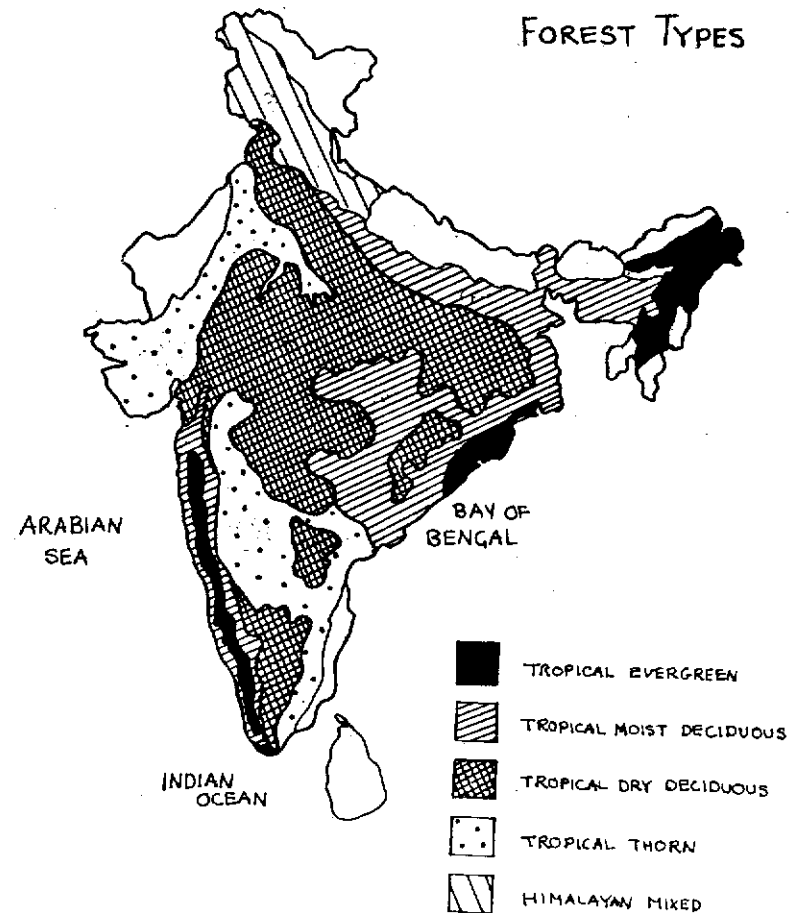
People — Main occupations

— Type of house

— Source of fuel

— Source of water

INDIA FOREST TYPES



Cherrapunji: the Wet Desert

Cherrapunji, in the hills of Meghalaya, was once reputed to be the wettest place on earth. It has an annual rainfall averaging more than 1,150 cms. Yet, all that grows in Cherrapunji today are dwarf grasses in the crevices of a devastated landscape. There is no vegetation to hold the soil, and no soil to support a forest.

Cherrapunji did support a forest once, and there are still some patches of forest nearby. In the past, these forests had been preserved by the local Khasi tribal people as *sacred groves*.

In all the North Eastern States the pressure on agricultural land is now acute. In the past the tribal farmers practiced shifting cultivation, known as *jhum* in which the forest tract is burned, cultivated for a couple of years, and then left fallow so that the vegetation is re-established and the soil recovers its nutrients. When the fallow period is long enough, about 20–30 years, this is an ecologically sound system in places of abundant rainfall and regenerative capacity.

But, these days with development and urbanisation, the area that the tribals can range over is severely restricted. They have to return to the same plots much more quickly. In Cherrapunji the fallow period is now a mere three-five years, too little time for the forest to grow again. The result is that the topsoil gets washed away every monsoon. It would now take many decades of letting the land lie fallow, if Cherrapunji is to be green once more.

Ironically, in the rainiest place on earth, drinking water is often in acute short supply. The water just runs off the sheer hills, down 1,500 metres to the plains of Sylhet in Bangladesh, causing the streams and rivers there to flood in the monsoon.

The proud *jhum* farmers, who once lived harmonious lives in a richly fertile area, are migrating to look for low paid jobs in the factories and the market towns.

* Destruction of Land, Water and Vegetation—

Roughly 50 percent of our land is eroded, degraded and depleted of its fertile potential; till recently, over a million hectares of valuable forests were being lost each year. In the 1980s, more than half of all our districts suffered from floods or droughts.



Activity

Mangroves : Where Land Meets Sea

Mangroves are short, dense trees that tolerate salt. They grow on coastal slopes in the area between the high and low tide levels, and are particularly abundant in the Indian Ocean and West Pacific region. Their long, spreading roots hold the coastal soil firmly and prevent the land from being eroded by powerful sea waves.

Mangroves also *build* land. The almost horizontal, cable-like roots of the trees form anchors in the soft mud. This traps the sediment flowing down the rivers to the sea. The front line of pioneering mangroves consists of *rhizophora* species. Other taller mangrove species then establish themselves on the mud bank behind the rhizoporas. The pioneering mangroves move progressively seawards. Behind them, the land is built up and the coast stabilised. This march of the mangroves can exceed 100 meters a year.

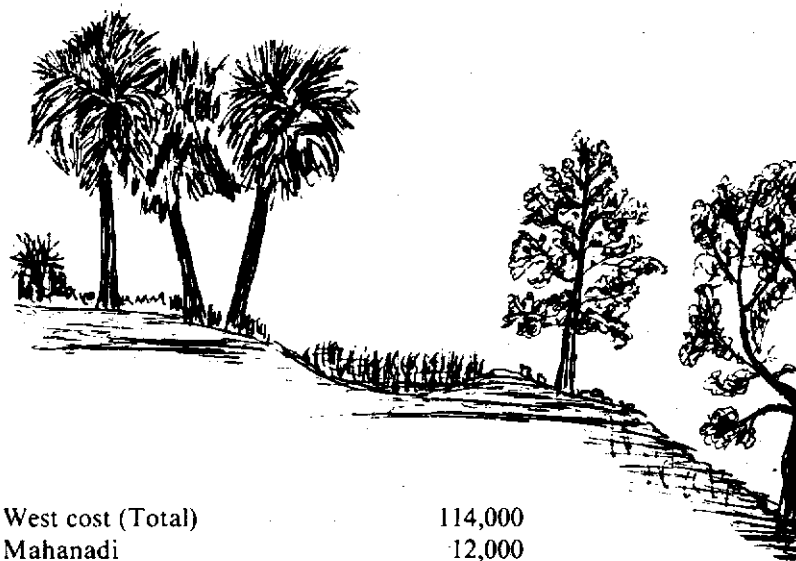
Mangroves provide a refuge for an immense variety of plant and animal life, which have evolved together in this saline environment. These include micro-organisms like yeast, bacteria and fungi, epiphytic plants, and animals such as river crocodiles, monkeys, otters, deer, fishing cats, snakes, wild pigs and many birds including herons, storks, sea eagles, kites, kingfishers, sandpipers, tits, bulbuls, whistlers, etc. However, the interactions in the mangrove ecosystem are complex and not well understood.

India's mangroves

India has some 60 species of mangrove trees and shrubs, and seven percent of the world's total mangrove area. The most extensive mangrove tracts are on the east coast, in the deltas of

the Ganga, Godavari, Mahandi, Krishna and Cauvery, and around the Andaman and Nicobar islands. The Gangetic Sundarbans is India's largest mangrove tract. On the west coast, only a few remnants of mangroves remain along the banks of estuaries, backwaters and creeks, and in the deltas of rivers such as the Tapti, the Narmada and the Sabarmati.

Sundarbans	420,000 ha.
Andaman & Nicobar	115,200



West coast (Total)	114,000
Mahanadi	12,000
Godavari & Krishna	20,000
Pichavaram (Gulf of Mannar)	11,000
Kaveri	2,540

Mangroves and the local economy

Along the Indian coast, human settlements are on the banks of

estuaries and deltas, near mangrove forests, but not within them. In the Sundarbans area alone villages are located within the mangrove forests.

Traditionally, coastal people have used mangroves for a variety of purposes, as firewood and for timber for poles and boats. In Kutch camels browse on mangroves in times of drought when fodder is scarce. The people collect honey from combs on some mangrove trees, extract tannin from the barks of other trees, use mangroves to prepare local medicines and make salt from mangrove water. The flowers, seeds and leaves of some mangroves are edible and provide food.

The organic debris from the mangroves makes the mangrove water a rich nutritious soup for the small animals in the food chain, invertebrates and spawning fish. Such an excellent "nursery" produces an abundance of fish. It has been estimated that 80% of the fishing catch in the Ganga-Brahmaputra basin comes from the Sundarbans alone.

Some mangrove areas are used to grow, paddy, coconut and other trees. Vegetables are also grown particularly on the bunds (artificial mud banks).



Land reclamation

The reclamation of coastal land is a major threat to mangrove swamps.

A mangrove forest is first surrounded by mud banks, which prevent the sea water from entering it. The water is drained out through an opening in the bund. The trees are cut and then the land is allowed to be inundated by rain water. This fresh water gets rid of the salt in the mangrove land. Once the degree of salt in the water is reduced, special varieties of paddy are grown.

The problem with such reclaimed land is that it is constantly threatened by waterlogging and salinity. As a result vast areas of reclaimed mangrove lands are no longer being used for cultivation of paddy. Instead, as in parts of Kerala, coconuts are being grown. Some lands are used as ponds for fish farming, and others have just been abandoned.

In 1670, there were seven islands surrounded by mangroves mid-way along the west coast. As the coastal area developed, the water between the islands was rapidly drained, and the islands were joined to form a continuous land mass. This is the city of BOMBAY. The mangrove forests between the islands were all destroyed in the process. Relics can be seen in the Thane and Bhaseen creeks. But here too new housing complexes are coming up, and the last of these mangroves may not survive.

Make your own mangrove forest — use painted cardboard cut-outs of the animals and trees. Or make a *diorama*, a series of pictures on a roll of paper illuminated and viewed through a hole in a darkened box.

Activity

Camping in the Mountains

The Chipko movement to protect Himalayan forests from being cut down for industrial purposes is well known. The women's declaration "We will hug the trees as a mother hugs her child to her breast to save it from the tiger's wrath"—gave the movement its creed of non-violent protest and its name Chipko (hug). Although the threat to hug the trees was rarely, if ever, actually carried out, the image of village women with their arms bravely clasped around forest trees became a worldwide symbol of community action.

The movement's role in afforestation and watershed development is less known. Organised by the Dasholi Gram Swarajya Mandal (DGSM), a small non-government group based at Gopeshwar in Chamoli district, Garhwal (Uttar Pradesh). Villagers have undertaken pioneering work in the rehabilitation of denuded hill slopes and degraded common lands. The DGSM was started in 1964 by Chandi Prasad Bhatt (the fountain head of the Chipko movement). It is a self-supporting organisation with its own resin, turpentine and varnish units and a flour mill. It has also received funds from the Khadi and Village Industries Commission, and more recently, from the Planning Commission.

Efforts have mainly been concentrated on the sensitive catchment areas of three tributaries of the Alakananda - the Garud Ganga, the Patal Ganga and Maina Gad. Through the years the DGSM has evolved a simple and very effective mechanism to further reclamation work. This is done through eco-development camps held in the villages, in which the villagers, the DGSM and interested outsiders participate.

For instance, in the late 1970s, work began at Pakhi village, where the slopes were prone to landslides. The stretches of

land most at risk were selected, and planted with species that the villagers chose. All the participants in the camp stood in a line and passed water containers 60 metres up from the Garud Ganga river to water the saplings. At the camp in another village, Bemru, participants helped the villagers build a protective rock wall. This was necessary because with increasing deforestation, the village fields were being attacked by wild bear and boar, destroying crops that the villagers could not afford to loose. In the space between the wall and the fields, fuel and fodder species were planted. Burnt leaves were used as pesticide and cowdung for fertiliser.

The concept of constructing stone walls to fortify agricultural fields, and planting the space between the field and the wall with useful trees is an innovation in the mountains. It was conceived by Chandi Prasad Bhatt as a multipurpose scheme which could also provide food-for-work (under a government programme) to poor people in remote villages. With the availability of firewood trees and fodder grasses (for hand-cutting) near the village, the women's work load could also be reduced. The vegetation would control soil erosion, possibly increasing the fertility of the soil and the productivity of the agricultural land.



Among the tree species that are being planted are *Bauhinia purpurea* (lal kachnar, or kuiral as it is known in Garhwal) *Morus serrata* (Himalayan mulberry, kemu) and *Grewia oppositifolia* (bhimal). The children of the Bemru village school collected seeds of *Bauhinia purpurea*, dried them in the school courtyard and started their own nursery.

One of the key inputs into the afforestation movement in these mountains is the organisation of informal women's groups, Mahila Mangal Mandals. The eco-development camps have highlighted the women's need to control village common lands. With their collective strength, the Mahila Mandals have succeeded in improving their lives.

Select a forested district, preferably one which you can visit. Before you go, find out as much as you can about its climate, topography and vegetation; the economy of the local people including their major occupations; and think about the kind of problems that they might face.

Government information centres, tribal welfare offices (for tribal areas), and the district information officer are obvious starting points. But government officials are often too busy to bother to reply to queries promptly. A useful alternative is the head of a bank operating in the district. It is best to try and locate a local non-government organisation, and organise a visit with its help.

For instance, if you want to visit Chamoli, write to the Dasholi Gram Swarajya Mandal, and ask how you can participate in an ecodevelopment camp.

There is nothing like a field visit to enthuse children, and adults, and to nurture their concerns. However, there are some basic 'rules' that must be followed.

1. Go as learners, with a willingness to educate yourself - not as teachers with messages to impart to rural people.
2. Plan well ahead, and make a flexible programme which doesn't have to follow a tight time schedule.
3. Pay all your own expenses. Voluntary workers and villagers will often willingly spare their time and make arrangements for you. But hospitality must not be exploited.
4. Don't expect city comforts. Be prepared to rough it out. That is a valuable learning experience in itself.
5. Respect other people's right to privacy. Don't take photographs of villagers who may not want to be photographed, for example.

★ The address: Dasholi Gram Swarajya Mandal
Gopeshwar
District Chamoli, Uttar Pradesh.



Activity

12

What is Development?

No country is fully developed, without the potential for further development. Each country develops in its own way. Each is rich and each is poor in some way. Some societies have concentrated on material progress, while others have developed different aspects of their life. Desert nomads, for instance, have evolved skills which enable them to live in an environment where the unskilled would perish. People can learn from each other's experiences, but they do not need to follow someone else's path blindly.

Look at this picture. Do you think the people in the picture

are usefully employed? What is the role of the man in the centre of the group? What do you think of this kind of development? Whom does it benefit?

Have a class discussion on this picture. Let children frame a topic for a debate, and present the pros and cons.

Help children to see "the other side" of a proposition. Help them to develop a rational argument. It might also be interesting for each person to write a note, first presenting one side of the issue, and then the other point of view. Help them to explore whether the two points of view can be reconciled.

(Adapted from: *World Concerns and the United Nations*, UN, New York)



SUBJECT WISE KEY TO ACTIVITIES

ACTIVITY NUMBERS

S.NO.	BOOK	LANGUAGE	ART & CRAFT	SCIENCE	HISTORY	CIVICS	GEO-GRAPHY	MATHS	GAMES & QUIZ	SPECIAL PROJECTS
1.	ONE EARTH	1,4,6,7, 9,10,11	2,9,12	5,7,8,10			1,3,4,5		8	10
2.	ECOLOGY	1,4,6,7 10,11,12	1,9,10 12	1,2,3,4, 5,6,7,8, 9,10,11			12	9	3,5,8,9	12
3.	LAND & WATER	1,3,7,11 12	1,7a	3,4,5,6, 7,7a	5	3	2,4,5,6 8,9,10,11		2,10	12
4.	TREES & FORESTS	1,12	2,3,10	3,4,5,8 10	4,12	6,7,9,10	6,7	5	11	
5.	LIVING RESOUR- CES	1,6,7,8, 9,11,12	1,3,4, 10,11	2,3,5,7 9,10,12		11			5	12
6.	HOUSES & CITIES	1,2,4,9 10,12	2,5,10	6,7,2	1,4,9,10	3,5,8 10,11,12	1,9	3,8	12	11
8.	ENERGY	1,2,3,11	1,8,9	3,4,5,6 10,11		2		4	4	11,12
9.	POLLUTION	1,2,3,5 6,8,10,11	2,5,7	5,6,8,9 10,11,12		3,5,6	4	9	8,12	